Support of Acoustic Measurements in Geologic Clutter

Michael T. Sundvik
Naval Undersea Warfare Center Division
1176 Howell St
Newport RI 02841
phone: (401) 832-8680 fax: (401) 832-2757 email: SundvikMT@npt.nuwc.navy.mil

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LONG-TERM GOALS

Characterize the nature of low- to mid- frequency acoustic reverberation data relative to specific geologic features mapped in the New Jersey Shelf STRATAFORM area leading to the fundamental knowledge of the causes of clutter in low and mid frequency monostatic and multistatic sonar systems.

OBJECTIVES

Provide calibrated, well-located acoustic reconnaissance reverberation data from low and mid-frequency systems relative to several mapped features in the New Jersey STRATAFORM area. Reverberation returns mapped into geographic coordinates will be used to guide the placement of resources in the main acoustic experiments to be conducted beginning in FY01.

APPROACH

Provide Test planning and Ship scheduling support to conduct of a reconnaissance test to be conducted prior to the April-May 2001 experiments. Modify existing software to provide a specialized data collection system which allows navigation, timing, array heading information and calibrated beam reverberation data time series for the towed array receiver of a US Navy surface ship to be utilized by a MIT workstation for the determination of geographic location of reverberation highlights. Provide ship, fleet interaction, installation, and logistic support for first Main Acoustic experiment to be conducted April-May 2001. Participate in Geologic Clutter workshops and meetings to provide coordination and information in planning for experiments, and data exchange.

RESULTS

Completed final preparations for Reconnaissance test using Navy Ship in April-May timeframe. Services granted were wrong platform type (SQS-53D not SQS-53C Ship). Next opportunity was for FY02 1st quarter. No services were available. Continued to roll over requests; next opportunity will be 3rd quarter FY02. Continuing to work problem with OPTEVFOR and SURFLANT.

Special calibrated beamformer for SQR-19 data has been developed and tested in the laboratory.

Participated in Geologic Clutter Acoustic Experiment April-May 2001 aboard R/V Endeavor, acting as Chief Scientist. Provided detailed test plan for coordinated bistatic acoustic operations between NRV Alliance and R/V Endeavor. Provided acoustic reflectors for use in experiment at second mooring site.

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Provided monitor hydrophone and recording system for characterization of source transmissions and acoustic channel measurements. Deployed instrumented tow cable for collection of temperature data continuously while at mooring site during nighttime hours, and between mooring sites during one transit. Initial Results are extremely promising, supporting the existence of strong returns from buried river channels and potentially other buried features.

Participation in the Geologic Clutter workshop October 2-3, 2001, and further analysis, will clarify importance of various returns and allow refocusing of planning efforts for the NUWC bottom reverberation survey to maximize utility of results. For the gray ship data collection effort we have been given a limited allowable data take, as required by environmental assessment mitigation efforts. (Number of SUS and source levels of hull active sonar have had to be limited).

IMPACT / APPLICATIONS

NUWC bottom reverberation survey data, when collected, will be used to determine distribution of reverberation and clutter in a "through the system" sense. Scientifically, the significance of low frequency (100 to 1000 Hz) and mid-frequency (2000 to 5000 Hz) acoustic reverberation energy from a variety of geologic features in shallow water will be mapped, and used to guide further experimentation to determine the causes of reverberation/clutter in shallow water environments.

TRANSITIONS

Data will be used to guide future classification efforts for bottom features in shallow water environments at low frequencies and mid frequencies. Fundamental research into causes of low frequency reverberation will also benefit.

RELATED PROJECTS

Littoral Water Advanced Development (LWAD). Sea test planning and environmental data collection were supported under LWAD during the LWAD 00-2 experiment conducted May 24-27 2000.

Environmentally Adaptive Sonar Technology (EAST). The 6.3-EAST program will benefit from analyses conducted on data collected using the AN-SQS-53C during the reconnaissance test by improvements to bottom backscattering and bottom loss estimation from specific geologic features.

Multistatic ASW Capability Enhancement (MACE) Reverberation data collected during the Geologic Clutter experiments pertains to the frequencies of interest to the MACE program, and employs bistatic geometries.

Characterization and Reduction of False Tracks (CRAFT). This ONR 321 6.2 Signal Processing project, begun in FY02 as a follow on to the ADAPT project, will directly benefit from data collected and analyzed during the Geologic Clutter Initiative.

PUBLICATIONS

Geoclutter Acoustics Experiment At-Sea Test Plan 2001 Manuscript Dtd. 19 April 2001

Sundvik et al., EN 353a Geologic Clutter Research Vessel Endeavor Cruise Report, in preparation.

Figure 1. Photos taken during participation in Geologic Clutter Acoustics Experiment. Clockwise from upper left: Dr. Richard Katz with the NRV Alliance in the distance; Twenty-five knot breeze from aft during the Instrumented Tow Cable event; The source array in its handling carriage at sea; The ITC winch and deck cable leading to lab; The chief scientist with NRV Alliance in the distance.